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ABSTRACT

This unit of instruction deals with a study of South Florida as an ecosystem. Consideration is given to meteorological features, geological foundations, chemical analyses, and biotic communities characteristic of South Florida. A major attribute is the development of monographs about the unique natural wealth of the lower South Florida peninsula. It is required that a student should have satisfactorily completed course work in biology equivalent to one year before taking this course. Relevant state-adopted texts are listed in the booklet. It provides performance objectives and the course outline and suggests laboratory exercises, student projects, demonstrations, field trips, and guest speakers. Particular emphasis is placed on the use of monographs, and suggested topics with specific instructions are provided. Also listed are relevant films, slides, and models from the Dade County Audiovisual Center. Supplementary references are recommended, and a master sheet is provided relating each suggested activity to the specific performance objectives. (EB)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

DADE COUNTY PUBLIC SCHOOLS

INTRODUCTION TO ECOLOGY OF SOUTH FLORIDA SPECIES

5365.41

SCIENCE
(Experimental)

SE 017 616

DIVISION OF INSTRUCTION • 1971

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Written by James F. Miley
for the
DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1972

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INTRODUCTION TO SOUTH FLORIDA ECOLOGY

COURSE DESCRIPTION

An introductory course providing a survey of South Florida as an ecosystem. Consideration is given to meteorological features, geological foundations, chemical analyses, and biotic communities characteristic of South Florida. A major attribute is development of monographs about the unique natural wealth of the lower South Florida peninsula.

ENROLLMENT GUIDELINES

This is for the serious biology student who has satisfactorily completed course work in biology equivalent to one year.

STATE ADOPTED TEXTS

1. Biological Sciences Curriculum Study. High School Biology: BSCS Green Version 2nd. Ed. Chicago: Rand, McNally and Co., 1968.

2. Biological Sciences Curriculum Study. Biological Science: Interaction of Experiments and Ideas - A BSCS Second Course. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1965.

PERFORMANCE OBJECTIVES

1. Students will illustrate the concept of an ecosystem in a small pond or lake using interdependence and causal relationships.

2. Given the major constituents of an ecosystem: abiotic substances, producers, consumers, and decomposers, students will apply them to characteristics of the South Florida ecosystem.

3. Given a transect section of South Florida from the east to west coasts, students will identify measurable climatological and meteorological phenomena.

4. Students will observe, measure, record and forecast the weather phenomena of a specified environmental area of South Florida.

5. Students will distinguish between the rock deposits and soils of South Florida which is part of the Coastal Plain physiographic region.

6. Students will identify the Biscayne aquifer by describing the four aquifers in Florida.

7. Students will analyse how the Kissimmee-Okeechobee-Everglades Basin affects the water dynamics in South Florida.

8. Students will investigate diurnal changes of water in South Florida using pH, gas content, and salts as determining factors.

9. Through a field study, students will investigate and record the interfacial action of soil and water at one foot sea level.

10. Students will gather data on a minimum of one community in <u>each</u> of the following categories:
    A. Sawgrass, other sedge and grass prairies.
    B. Cypress heads and strands.
    C. Sloughs and alligator holes.
    D. Palmetto and pinelands.
    E. Hammocks
    F. Mangroves
    G. Turtle grass and other marine communities.

11. Through experimental design, students will synthesize information which will describe a South Florida community.

12. Students will investigate, develop and write a minimum of one monograph on any student-selected topic of South Florida ecology.

COURSE OUTLINE

I. South Florida as an Ecosystem

A. Location

B. Forces Causing Change

C. Characteristics

II. Meteorological Features

A. Precipitation

B. Barometric Pressure

C. Temperature

D. Relative Humidity

E. Wind

F. Clouds

G. Marine Environmental Control

H. Local Variation

III. Geological Foundations

A. Rock Deposits

1. Limestone
2. Sandstone
3. Bryozoan rock
4. Coral rock

B. Characteristic Soils

1. Peats and mucks
2. Marls
3. Sands

C. Water Dynamics

1. Biscayne aquifer
2. Diurnal changes
3. Water Qualities

a. pH
b. Alkalinity
c. Carbon dioxide
d. Oxygen
e. Total salts

IV. Interfacial Action between Soil and Water

V. South Florida Communities

A. Sawgrass

B. Other sedge and grass prairies

C. Cypress heads

D. Strands

E. Sloughs

F. Alligator holes

G. Palmetto

H. Pinelands

I. Hammocks

J. Mangroves

K. Turtle grass

L. Any typical marine community

VI. Monographs

LABORATORY EXERCISES

Biological Sciences Curriculum Study. High School Biology: BSCS Green Version, 2nd Edition. Chicago, Illinois: Rand McNally and Company, 1968.

1. Interrelationships of Producers and Consumers (Ex. 1-5, p. 26)
2. Study of a Biotic Community (Ex. 3-1, p. 76)
3. Abiotic Environment: A Comparative Study (Ex. 3-2, p. 98)
4. A Study of Environmental Tolerance (Ex. 8-1, p. 254)
5. Temperature, Rainfall, and Biome Distribution (Ex. 8-2, p. 282)
6. Succession in a Freshwater Ecosystem (Ex. 9-1, p. 312)

Beakley, John and others. The Source Book of Marine Sciences. Tallahassee: Department of Education, 1970.

7. Beach Analysis (Parts I-VI, p. 23)
8. pH Determination of Sea Water (p. 23)
9. The Determination of the Salinity of Sea Water: Refractometer Method (p. 39)
10. The Determination of the Salinity of Sea Water: Titration Method (p. 43)
11. Plankton (p. 61)
12. Light: The Importance of the Study of the Physical and Biological Properties of Light in Ocean Water (p. 139)

Dade County Public Schools. Ecology and Natural History of South Florida, Experimental Curriculum Bulletin 8B-2. Miami, Florida: Dade County School Board, 1970.

13. Progression Laboratory: Geology of South Florida (p. 12)
14. Testing Soil Hardness (p. 24)
15. Variety of Florida Rocks and Minerals (p. 30)
16. The Ability of Soil to Hold Water (p. 36)
17. Chemical Determination of Salinity in Sea Water (p. 37)
18. Meteorology (p. 52)
19. Standard Measurements of Clouds (p. 54)
20. Temperature, Dew Point, Relative Humidity (p. 58)
21. Wind Direction and Velocity (p. 61)
22. Barometric Pressure (p. 62)
23. Amount of Rainfall (p. 64)
24. Forecast Weather Conditions (p. 65)
25. Determining the Amount of Dissolved Oxygen in Water (p. 105)
26. Chemically Determine the Carbon Dioxide Content of Sea Water (p. 107)
27. Measure the Turbidity of Water (p. 114)
28. Samples of Green Algae as Representatives of the Group of Food Producers (p.132)
29. Constructing An Ecological Pyramid for a Water Hyacinth Community (p. 145)

Lawson, Chester A. and Paulson, Richard E. Laboratory and Field Studies in Biology - A Source Book for Secondary Schools. New York: Holt, Rinehart and Winston, Inc., 1960.

30. Animals At the Beach (Section I, Topic B, Study 1, p. 12)

31. A Method of Measuring Carbon Dioxide (Section IV, Topic B, Study 8, p. 141)
32. Carbon Dioxide Changes in an Aquatic Environment (Section IV, Topic B, Study 9, p. 143)

Storin, Diane. Investigating Air, Land, and Water Pollution. New York: Pawnee Publishing Company, Inc., 1971.

33. Locating Sources of Fresh Water (p. 60)
34. Testing the Hardness of Your Water Supply (p. 68)
35. Testing the Oxygen Content of Water Samples (p. 72)

DEMONSTRATIONS

1. How to collect and prepare soil samples.
2. Use of the Berlese funnel for collecting small soil animals.
3. Suggestions on the collection of water samples.
4. The Hydrologic Cycle
5. Apparatus for Limnology studies: Bottom grab, secchi disk, core, water bottle, plankton net, stream collector, et. al.
6. Determination of $CaCO_3$ in sand samples.
7. Construction of Climographs.
8. Techniques for using the 24-hour clock.
9. Techniques for charting local current systems.
10. Technique for study of particle size in sedimentation rates.
11. Techniques for measuring turbidity.
12. Construction of a food chain by stomach analysis.
13. Methods of graphical representation of trophic level biomass relationships.
14. Preparation of herbarium mounts.

PROJECTS

1. Construct a partial food web for a South Florida Canal Bank.
2. The feeding habits of fish.
3. Determination of population size by the Lincoln Index Method.
4. Analysis of marine populations.
5. The decomposition of cellulose in an ecosystem.
6. The role of dissolved organic substances which are abundant in water and soil.
7. Field survey of one of the following:
   - Coral reef
   - Fresh water canal or river
   - Hammock
   - Mangrove area
   - A Florida key
   - Palmetto-pinelands
   - Beach flora-fauna
8. Gross mapping of vegetation in Big Cypress Swamp

MONOGRAPHS - TOPICAL SUGGESTIONS (See Special Instructions, p. 16)

1. Fires of South Florida: Location, Date, Severity and Significance
2. Fahkahatchee Strand: Logging and Fires, 1940-1970
3. Chemical Analysis of South Florida Surface Water
4. Water Control in Peat and Muck Soils
5. Pros-Cons of the Jet Port - "The Leopold Report"
6. Local Variation of the Meteorological Features of South Florida
7. The Jet Port Dwarf Cypress Grove
8. Diurnal Changes in a Water Habitat
9. The Everglades: "Yo-yo" Effect from Artificial Manipulation of the Water Supply
10. Kissimmee-Okeechobee-Everglades Basin: Canals, Levees, Dikes and Dams, Their Effects 1881-1970
11. The Big Cypress Watershed and Its Impact
12. The Hydrologic Effects of the Pump Station S-140 and Levee L-100
13. Water Quality in Lake Tohopekaliga of the Kissimmee Lakes Chain
14. Predicting the Affects of Constructing Canals C-108, C-109, and C-110
15. What is a Jim Brevis (Cymnodimium brevis)?
16. Progress Report of the Everglade Kite
17. Impact of Sloughs: Okaloacoochee, Taylor, Shark River, and Others
18. The Saline Mangrove Crescent
19. Tropical Hardwood Hammocks: An Element in the Regional Landscape
20. The Food Chain of Swamp Life in a "Gator Hole"
21. The Role of Tidal Marshes in Estaurine Production
22. The Role of the Alligator in Shaping Plant Communities and Maintaining Wildlife in the Everglades
23. "Pa-hay-o-kee", Grassy Waters - Its Relationship in the South Florida Ecosystem
24. Sawgrass Prairies of the Everglades
25. Forest Vegetation: Pinewoods, Hammocks, and Bayheads
26. Rare and Endangered Mammals: Florida Panther and Manatee
27. What is the Status? Florida Water Rat, Everglades Mink and American Osprey

28. Duck Rock - An Offshore Island Rookery
29. Saw Palmetto Rings - Mystery of the Everglades
30. Biscayne Bay - A Shallow Sub-Tropical Estuary
31. Thermal Pollution and Turkey Point
32. Significance of the Strangler Fig
33. Still, Sunny Water and the Water Hyacinths
34. Caesar's Weed and Melaleuca - Arch Pests?
35. Thermal Aquaculture
36. The Tropics: A Frontier in Meteorology
37. Life in Thallasia Beds
38. Birth of a Florida Key
39. Fossilized Mangrove Reef
40. Life on a Key: Elliott, Kingston, Paradise, Big Pine, Arsenicker or One of Your Choosing
41. Fresh Water Algae of South Florida
42. The Jet Stream and South Florida Weather
43. South Florida Thunderstorms - A Meteorological Mystery
44. Atlantic Hurricanes - History of Reality
45. Why Don't Hurricanes Occur More Often? Changing Trends in Storms
46. Rainfall Frequency and Local Variation
47. Analysis of Tornadoes From the Kissimmee-Okeechobee-Everglades Basin Through the Florida Keys
48. Man - Changing the Local Weather
49. Numerical Weather Analysis and Predictions in Broward, Dade, Collier and Monroe Counties
50. Interdependence Around a Coral Reef
51. Fauna of a Sand Flat Habitat
52. The Coconut Crab (Birgus latro) - Is There a Habitat in South Florida?
53. Significance of Organic Compounds in Sea Water
54. Comparison of Size Fractions Employed in Mineralochemical Analysis And Physical Analysis of Soils Found in South Florida
55. The Rate of Growth of Periphyton in a Specified Area of the Big Cypress Swamp
56. Waves and Beaches - The Dynamics of the Ocean Surface
57. The Gulf Stream Story
58. Trees of South Florida - Unique Communities and Interrelationships
59. Habitat and Behavior of Endangered Bird Species of the Everglades
60. Characteristics, Niches, and Environmental Factors of the Red, White, and Black Mangroves
61. Ecology of Lignum Vita Key
62. A Study of Plankton-Microorganisms in a Selected Fresh Water Lake
63. Hurricane Donna - Ten Years Later
64. The Geologic Work of Mangroves in Southern Florida
65. Flora and Fauna in the Ten Thousand Islands
66. Bird Rookeries of the Everglades
67. A Study of Epiphytical Plants Endemic to Florida
68. An Examination of Seasonal Changes in Trematode Populations
69. Life on the Mud Flats
70. Modification of Florida's Normal Water Drainage Systems
71. The Effects of Algal Blooms in the Ecology of the Everglades
72. A Study of Wild and Native Ferns of South Florida
73. Solution Holes: A Geologic Feature of the South Florida Terrain
74. The Ecology of Bear Cut
75. Characteristics and Significance of the Key Deer

76. The Color Change of the Fiddler Crab: A Mystery of the Marshlands and Sandy Flats
77. A Study of the Florida Tree Snail (Liguus)
78. Survival Relationship of the Everglade Kite (Rostrhamus sociabillis) and the Snail (Ampularia, sp.)
79. Florida Marine Shelling: Southeastern Atlantic and Gulf Coasts
80. Bird Field Study of a Selected Area, such as,
    Miami Bayfront Park
    Rickenbacker Causeway, Virginia and Biscayne Keys
    South Allapattah Farmlands (Old Cutler Road, Richmond Road, Deering Estate, Franjo Road, Galloway Road, Black Creek, Coconut Palm Drive)
    The Tamiami Trail and Loop Road
    Everglades National Park
    Greynolds Park
    Lower Keys Area
    The Dry Tortugas
    Corkscrew Swamp Sanctuary
81. The Saga of the Cross-Florida Barge Canal

FIELD TRIPS

1. Rickenbacker Causeway, Virginia and Biscayne Keys
2. Dade County Public Schools Environmental Education Center Area
3. The Tamiami Trail and Loop Road
4. Everglades National Park: Florida City - Cape Sable
5. Everglades National Park: Shark Valley Loop Road
6. Everglades National Park: Everglades City - Chokoloskee
7. Fahkahatchee Strand - Collier County
8. Jet Port Area (by permission and arrangement)
9. Weather Bureau, Experimental Meteorology and National Hurricane Center Research Laboratories
10. Corkscrew Swamp Audubon Sanctuary - Naples, Florida
11. Lake Tohopekaliga - Kissimmee, Florida
12. Ten Thousand Islands and Marco Island
13. South Florida Flood Control Canals and Levees
14. Florida Power and Light Company's Turkey Point (by arrangement)
15. Florida Keys: Elliott, Kingston, Paradise, Big Pine, Arsenicker, Lignum Vita, Long, Key West, Key Largo and others
16. Matheson Hammock
17. Black Point Park
18. Owaissa Bauer Park
19. Bear Cut
20. Greynolds Park
21. Viscaya and Museum of Science Nature Trails
22. Area of Lake Okeechobee
23. Miami and Homestead Bayfront Parks
24. University of Miami Data-Collecting Stations in the Everglades (by arrangement)
25. Lower Keys Area
26. Sanibel-Captiva Islands
27. Fuch's Park - Homestead, Florida and Simpson Park - Miami, Florida
28. Cape Florida State Park
29. John Pennekamp State Park - Key Largo, Florida

30. Hugh Taylor State Park
31. Pahokee (Thirty Acres on U. S. 441)
32. Miami Central Senior High School Lake
33. Tropical Park Fresh Water Lake
34. Sewell Park
35. Lake Apopka - Apopka, Florida
36. Selected Points Along the Miami River

SPEAKERS

1. Dr. Leonard J. Greenfield, Chairman
   Department of Biology
   University of Miami

2. Mr. Leonard Pardue
   U. S. Weather Bureau
   Computing Center Building
   University of Miami

3. Mrs. Patti Amon
   Metropolitan Dade County
   Parks and Recreation Department

4. Tropical Audubon Society Speakers
   Arranged by Flora O'Brien - 443-5418 (Telephone after 4:00 P. M.)

5. Park Rangers
   Arranged by contacting: Everglades Park Headquarters
   State Road 27
   Homestead, Florida
   Telephone: 247-6211

6. Arthur R. Marshall
   Center for Urban and Environmental Studies
   University of Miami

7. Mr. James Redford
   Mangrove Chapter
   Izaak Walton League of America

8. Speakers available from Rosenstiel School of Marine and Atmospheric Sciences. Write to: Public Information Office
   Rosenstiel School of Marine and Atmospheric Sciences
   University of Miami
   Rickenbacker Causeway
   Miami, Florida 33149

9. Speakers available from the U. S. Geological Survey
   Contact: Dr. Benjamin McPherson
   U. S. Geological Survey - Water Resources Division
   51 S. W. 1st Avenue
   Miami, Florida
   Telephone: 350-5382

10. Dr. William Woodley
National Hurricane Research Laboratories
Computing Center Building
University of Miami

FILMS

Dade County Public Schools 16mm films available at Audio-Visual Services, Lindsey Hopkins Building

1. Adventuring in Conservation
AV# 1-10218, 13', C
2. Animal Life Cycle, An (AIBS Pt. 5, No. 2)
AV# 1-30539, 28', C
3. Anyone for Diving
AV# 1-30859, 30', C
4. Amazing Central Florida
AV# 1-12918, 14', C
5. Birds of a Florida Marsh
AV# 1-11196, 14', C
6. Birth of a Florida Key
AV# 1-12252, 18', C
7. Blessing From the Sea
AV# 1-11022, 20', C
8. The Enchanted Key
AV# 1-02947, 10', C
9. Fabulous Florida
AV# 1-30949, 30', C
10. Feathered Aristocrats (Local Song Birds)
AV# 1-11199, 13', C
11. Florida
AV# 1-04911, 10', C
12. The Florida Alligator
AV# 1-02885, 6', C
13. A Florida River: Its Wildlife (St. Lucie)
AV# 1-04923, 11', C
14. Just Off Shore
AV# 1-02958, 11', C
15. Prowlers of the Everglades
AV# 1-30952, 26', C
16. Royal Birds of Florida
AV# 1-029078, 10', C
17. Sea Turtles of Florida
AV# 1-11191, 14', C
18. Snakes of Florida
AV# 1-02877, 6', C
19. The Story of the Sponge
AV# 1-11527, 10', BW
20. The Wonderful World of Florida
AV# 1-12944, 15', C
21. The Everglades: Conserving a Balanced Community
AV# 1-13868, 15', C
22. Animal Life at Low Tide
AV# 1-02696, 11', C

23. Partnerships Among Plants and Animals
AV# 1-02657, 11', C
24. Life Along the Waterways
AV# 1-02194, 11', C
25. Animal Habitats
AV# 1-02370, 10', C
26. Balance in Nature
AV# 1-11141, 17', C
27. Conserving Our Water Resources Today
AV# 1-00426, 11', C
28. Diversity in Form and Size
AV# 1-31535, 28', C
29. Interrelationships For Survival
AV# 1-30558, 28', C
30. Strange Partners: Symbiosis in the Sea
AV# 1-13718, 13', C
31. Geography of Your Community
AV# 1-04563, 10', C
32. Waves on Water
AV# 1-10987, 16', C
33. Origin of Weather
AV# 1-30376, 26', BW

Educational Media Center, F. S. U., Tallahassee, Florida 32306
(Rental charge for films)

34. Around a Big Lake, 17', C, IBF ($7.00)
35. Beach and Sea Animals, (Second Edition) 11', BW ($2.00)
36. Great Weather Mystery 27', BW, McGraw-Hill ($5.75)
37. Plant-Animal Cummunities: Interrelationships, 14', C, Coronet ($4.95)
38. Changing River, 16', C, IBF ($5.80)
39. Energy Relations, 29', C, McGraw-Hill ($7.95)
40. Limnology, 29', C, McGraw-Hill ($7.95)
41. Florida: Wealth or Waste, 22', C, Southern Ed. ($5.40)
42. Challenge of the Oceans, 27', C, McGraw-Hill ($6.75)
43. Marine Ecology, 29', C, McGraw-Hill ($7.95)
44. Weather, 11', BW, EBF ($2.00)
45. Wildlife in a Southern Slough, 11', C, IFB ($3.75)

DADE COUNTY AUDIO-VISUAL SLIDES

1. Everglades National Park, C, 2 x 2 Slides
   AV# 5-20094, 14 Slides
2. Florida Birds and Wildflowers, C, 2 x 2 Slides
   AV# 5-70017
3. Key West, Florida, C, 2 x 2 Slides
   AV# 5-20021
4. Alligators, 11, 2 x 2 Slides
   AV# 5-20008
5. Swamp Scenery, 28, 2 x 2 Slides
   AV# 5-20094

DADE COUNTY AUDIO-VISUAL MODELS

1. Florida Bay Model
   AV# 6-00126, C 8
2. Florida Rocks and Minerals
   AV# 6-00129, C 18
3. Florida Shells, Set 1
   AV# 6-00121, C 59
4. Florida Shells, Set 2
   AV# 6-00052, C 19 (26p)
5. Florida Shells, Set 3: Univalve and Bivalve
   AV# 6-00159, C 72
6. Soils of Florida
   AV# 6-00032 C 8

SUGGESTED DISCUSSION QUESTIONS

1. Does thermal pollution affect life in Biscayne Bay?
2. What position does periphyton occupy in the food chains of consumer organisms?
3. How would rapid thermal increases affect copepods?
4. What would happen if Dade County lost all of its water supply?
5. The pros-cons and alternatives of the Jet Port.
6. What effects does water control have on the peat and muck soils of the Everglades?
7. What is the Floridan Plateau?
8. What is happening to the sea level right now?
9. Distinguish five types of hammocks.
10. Describe a "gator hole".
11. Discuss how fire is a major influence on land, much of which is submerged for half the year.
12. Compare flora and fauna of the West Indies with South Florida.
13. Give reasons for the establishment of the Everglades National Park.
14. Discuss the seasonal cycle of rising and falling water as a dominant fact in the lives of all animals of the Everglades.
15. Describe the structure and distribution of coral reefs.
16. Trace biologically the evolution of the Florida Keys.
17. Discuss important climatic factors for reef and lagoon biology.

Beakley, John and others. The Source Book of Marine Science. Tallahassee: Department of Education, 1970.

18. p. 13 - #1 - 9 Tides
19. p. 16 - #1 - 5 Current Systems
20. p. 27 - #1 - 4 Sand Particles
21. p. 31 - #1 - 5 Turbidity
22. p. 34 - #1 - 3 Nonfilterable Residue

23. p. 37 - #1 - 5 pH of Sea Water

24. p. 49 - #1 - 4 Marine Bacteriology

25. p. 70 - #1 - 15 Plankton

26. p. 107 - #1 - 6 Statistical Analysis

27. p. 136 - #1 - 7 Feeding Habits of Fish

28. p. 138 - #1 - 4 Salinity

29. p. 146 - #1 - 4 Marine Populations

30. Describe the physiographic regions of Florida

31. What are the characteristic soils of Florida and the causes of their formation?

32. What is the role of dew in an ecosystem?

33. How could fluctuations in salinity affect the biological population in an area?

34. What steps can be taken to protect natural areas from destruction?

35. Discuss plant and animal succession from saw grass to the highest point in a hammock.

36. Discuss Greynolds Park as an ecological community and compare it to other Dade County Parks.

37. What are the advantages and disadvantages of a cross-Florida barge canal?

38. Analyze the Environmental Education Act, Public Law 91-516 as it relates to Florida.

SPECIAL INSTRUCTIONS

1. It is expected a major contribution from this course will be a monography by students, either singly or in small groups.

2. A monograph is defined as a methodical, written discussion of the facts and principles involved and conclusions reached.

3. A list of topics for monographs are found on pages 7 - 9 of this course.

4. The components of a monograph should include:

TITLE PAGE - Include a title adequately describing the research, your name, name of your teacher, school location, and the date.

ABSTRACT - This is a summary of the results and conclusions presented in the monograph. In general, the abstract should not be longer than one page. Include the title, your name, school name, and date at the top of the page.

INTRODUCTION - Tell why the problem you selected was worth investigating and what the state of knowledge was at the time you undertook the problem.

PURPOSE - In particular, you should state clearly what you were trying to accomplish by your research.

METHOD - Include information on analytical procedures, statistics, experimental techniques, and other significant activities.

RESULTS - Present the data in an organized form. This is frequently done by means of graphs and tables. The data may be discussed in terms of its strengths and weaknesses. It may compare your results with those of others and suggestions for further investigations.

SUMMARY - State briefly what experiments you did, what the results were, and what conclusions you reached from these results.

REFERENCES - List all the references to the scientific literature made in the body of the report. Any one of several styles may be used in listing the bibliography.

5. The additional supplementary materials listed on page 19 are indicated as general resources because of the numerous articles and information available from each source. These resources will provide information and materials for monographs, field studies, and activities. Teachers may contact the sources directly or use the Reader's Guide to Periodical Literature in the library. Generally, information from the last 5-7 years only should be considered.

6. The student text references are to be considered for review of basic concepts rather than for major instructional emphasis since it is assumed students have had a year of biological study. These basics will need to be extrapolated to South Florida ecology.

SUPPLEMENTARY RREFERENCES

1. Amos, William H. Limnology - An Introduction to the Fresh Water Environment. Chestertown, Maryland: LaMotte Chemical Co., 1969.

2. Atkinson, Brooks. "Biscayne Bay - The Spender, The Endless Fight to Save It". Audubon. 725: 36-47, 1970.

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19. Odum, E. P. Fundamentals of Ecology. Philadelphia, Pennsylvania: W. B. Sunders Co., 1963.

20. Pettit, Ted S. A Guide to Nature Projects. New York: W. W. Norton and Co., 1966.

21. Renn, Charles E. Investigating Water Problems. Chestertown, Maryland: LaMotte Chemical Co., 1970.

22. _____. Our Environment Battles Water Pollution. Chestertown, Maryland: LaMotte Chemical Co., 1969.

23. _____. A Study of Water Quality. Chestertown, Maryland: LaMotte Chemical Co., 1968.

24. Reynolds, William M. and Unger, James J. Second Thoughts on Environmental Control. Skokie, Illinois: National Textbook Co., 1970.

25. Robertson, Jr., William B. Everglades - The Park Story. Coral Gables, Florida: University of Miami Press, 1959.

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ADDITIONAL SUPPLEMENTARY MATERIALS

1. AUDUBON
   National Audubon Society
   1130 Fifth Avenue
   New York, N. Y. 10028

2. ECOLOGICAL MONOGRAPHS
   Duke University Press
   Durham, N. C. 27706

3. FLORIDA CONSERVATION NEWS
   Florida State Board of Conservation
   Tallahassee, Florida 32304

4. FLORIDA WILDLIFE
   Florida Game and Fresh Water Fish Commission
   Tallahassee, Florida 32304

5. THE FLORIDA NATURALIST
   Florida Audubon Society
   P. O. Drawer 7
   Maitland, Florida 32751

6. SCIENCE
   AAAS
   1515 Massachusetts Ave., N. W.
   Washington, D. C. 20005

7. SCIENTIFIC AMERICAN
   Scientific American, Inc.
   415 Madison Ave.
   New York, N. Y. 10017

8. SEA FRONTIERS AND SEA SECRETS
   International Oceanographic Foundation
   1 Rickenbacker Causeway
   Virginia Key
   Miami, Florida 33149

9. MAPS - PAMPHLETS
   U. S. Geological Survey
   51 S. W. 1st Avenue
   Miami, Florida

10. BULLETINS
    University of Florida Agricultural Experimental Station
    Gainesville, Florida

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Objectives	Information Input/Output	Systems Units	Science Activities	Experiments	Mass Spectra	Filters	Slides	Models	Suggested Discussion Questions	Special Instructional Items	Supplementary References	Additional Materials
1	1,2,5,7,13, 28,29	#1. Chap. 1 #1. Chap. 2 #1. Chap. 3 #1. Chap. 7 #1. Chap. 8 #1. Chap. 9	12,13	1,2, 3,4, 5,7, 8		1,2,3, 4,5,6, 7,10, 11,12, 15,16, 17,18, 19,20, 22,24, 25,26, 27,29, 31,32, 33,35	1,6,8,9	2,4,7, 6,8,11, 13,14, 19,20, 21,22, 23,24, 25,26, 28,29, 31,34, 35,37, 38,41, 45	1,2,3	1,2	2,4,9,11, 12,14,15, 16,18,21, 24,27,28, 29,30,32, 33,34,35, 36	5,6	25,28,19, 15,27,9, 26,14,11, 30,20,3, 7,12,2	1,2,3,4,5, 6,7,8,9,10
2	1,2,3,4,6, 7,12,13, 15,28,29, 30,32	#1. Chap. 1	4,5,6,7, 9,12,13	1,2, 3,4, 5,7, 8		1,2,3, 4,5,6, 7,10, 11,12, 13,15, 16,17, 18,19, 20,21, 22,23, 24,25, 26,27, 28,29, 30,31, 32,33, 34,35	1,2,4,5, 6,7,8,9	2,4,5, 6,8,9, 10,11, 13,14, 20,21, 22,23, 24,25, 26,28, 29,30, 31,34, 35,37, 38,41, 42,43	1,3,3, 4,5	1,2, 3,4, 5,6	2,6,7,8,9, 10,11,12, 13,14,15, 16,17,18, 21,24,25, 26,27,29, 30,31,32, 33,35,36	5,6	25,28,19, 15,27,9, 26,14,11, 30,4,20, 3,21,2, 12,2	1,2,3,4,5, 6,7,8,9,10
3	3,4,5,14, 16,18,19, 20,21,22, 23,24	#1. Chap. 1 #1. Chap. 2	3,4,5,7, 8,9	3,2		1,2,8, 9,13, 14,21, 24	1,2,5,6, 8,9,10	1,4,9, 11,20, 31,32, 33,36, 39,41, 44			4,5,7,11, 14,17,18, 19,20,21, 27,28,30, 32,34,38	5,6	19,15,9, 29,13,6, 5,16,24, 20,21,23, 22,1	1,2,3,4,5, 6,7,8,9,10
4	3,4,5,18, 19,20,21, 22,23,24	#1. Chap. 2 #1. Chap. 8 #1. Chap. 11	3,7,8,9			1,2,3, 4,5,6, 7,8,9, 10,15, 16,17, 18,19, 20,23, 24,25, 32,33	2,4,5,9, 10	9,11, 20,31, 32,33, 34,35, 39,41, 44	1,3		12,13,14, 17,18,19, 20,30,34, 38	5,6	25,28,15, 27,9,11, 30,20	1,2,3,4,5, 6,7,8,9,10
5	14,15,16	#1. Chap. 1 #1. Chap. 8 #1. Chap. 11	1,2,6,8	6,8		1,2,3, 4,5,7, 10,14, 15,16, 18,23, 25,26, 31	1,3,4,5, 6,7,9	1,6,8, 11,21, 31		6	20,21,22, 30,31	5,6	6,16,25, 28,19,15, 9,30,14, 11,20,10	1,2,3,4,5, 6,7,8,9,10
6	5,23,33, 34,35		3,4,5			9	1,2,6,4, 9,10	11,21, 27,31, 34			6,8,14, 19,37,39	5,6	15,9,11, 13,25,28, 19,5,16, 24,20,1, 21,22,23	1,2,3,4,5, 6,7,8,9,10
7	5,6,33, 34,35		4,4,5	6,7, 8		7,8,9, 10,11, 33,32, 35,31, 4	1,2,4,4, 9,10	11,13, 21,23, 27,31, 33,35, 40,41		1	4,6,7,8, 11,14,19, 21	5,6	25,28,17, 19,15,11, 29,13,30, 5,16,24, 20,23,1, 21,22,23	1,2,3,4,5, 6,7,8,9,10

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Objectives	Laboratory Experiments	Student Texts	Demonstrations	Projects	Monographs	Field Trips	Speakers	Films	Slides	Models	Suggested Discussion Questions	Special Instructions	Supplementary References	Additional Materials
8	4,7,8,9, 10,12,17, 25,26,27, 31,32,35	#2. Sec. 6	3,6,8,10	1,4,7		1,2,4, 12,15, 16,19	1,8,9	14,22, 24,25, 26,27, 31,32, 35,37, 42,43			4,8,14,18, 19,20,21, 22,24,26, 28,29,33	5,6	19,15,27, 9 11,8, 28,18	1,2,3,4,5, 6,7,8,9,10
9	5		1,2,3,5, 8,13	7		1,2,4, 12,16, 19	1,9	21,25, 29,31	1,5	1	14,30	5,6	11,20,19, 25,28,15	1,2,3,4,5, 6,7,8,9,10
10	1,2,6,7, 12,28, 29,30	#1. Chap. 1 #1. Chap. 3 #1. Chap. 7 #1. Chap. 8 #1. Chap. 9 #1. Chap. 11 #1. Chap. 20 #2. Sec. 9	12,13	1,2,3, 4,7,8		1,2,3, 4,5,6, 7,10, 11,14, 15,16, 17,18, 19,20, 22,24, 25,26, 31,32, 33,35, 36	1,3,4, 5,6,7, 8,9	4,5,6, 8,9,10, 11,12, 13,14, 15,16, 17,18, 19,20, 21,22, 23,24, 25,26, 29,31, 34,35, 37,41, 43,45	1,2,3, 4,5	1,2,3, 4,5	7,9,10, 12,13,15, 16,24,25, 26,27,29, 30,35,36	5,6	25,19,23, 15,27,17, 9,26,14, 11,6,30, 4,31,20, 1,7,12,2	1,2,3,4,5, 6,7,8,9,10
11	2,6,7, 11,29, 30		12,13,14	1,2,3, 4,7,8		1,2,3, 4,5,6, 7,10, 11,12, 14,15, 16,17, 18,19, 20,21, 27,24, 25,26, 27,29, 30,31, 32,33, 34,35	1,3,4, 5,6,7, 8,9	4,5,6, 8,9,10, 11,12, 13,15, 16,17, 18,19, 20,21, 31,41, 45	1,2,3, 4,5	1,2,3, 4,5	7,9,10, 13,15,16, 18,21,24, 25,26,27, 29,33,35, 36	5,6	25,28,17, 19,15,27, 9,26,14, 11,4,31, 3,12,2	1,2,3,4,5, 6,7,8,9,10
12	29,31, 35	#2. Sec. 4 #2. Sec. 18	1,2,3, 5,6,7, 8,9,10, 11,13, 14	3,4,7, 8	1-81	1-36	1-10	1-45	1,2,3, 4,5,	1-6	1-38	1-6	1-31	1,2,3,4,5, 6,7,8,9,10